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§22. Automatic Physical Data Update System

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The Kaiseki Server system supplies the physical data of the LHD experiment for the researchers, and there are more than 100 kinds of physical data are registered. Some of the data is directly calculated from the raw signal data, and the others are calculated from the other physical data. Therefore, there are dependencies among the physical data. Fig 1 shows the diagram of the physical data. As shown in Fig.1, many diagnostics depend on TSMAP. TSMAP is the electron temperature and density mapped on the effective coordinate, and it is a basic information for the physical analysis. On the other hand, TSMAP is calculated from 'thomson', the temperature and density measured by the real coordinate. Therefore, if 'thomson' is updated, TSMAP must be recalculated, and other diagnostics that depends on TSMAP, such as, 'tsmap, 'tsmesh', 'ermap', etc. must be also recalculated. However, the researchers responsible for the diagnostics are different from one diagnostics to another. Therefore, it is necessary to ask all the responsible persons for the dependent diagnostics to register data.

In order to smooth the recalculation process, the authors have developed the automatic update system[1]. Fig. 2 shows the overview of the automatic update system. The flow of the registration is as follows. When the client registers a new diagnostics data, the database notifies the registration data of the registration. The registration daemon put the calculation task into the job queue, and the executer run the calculation program one by one from retrieving the task from the queue.

The Kaiseki Server provides the physical data of the LHD experiment. The client uses the SOAP interfaces to register the physical data. When the server receives the physical data from the client, the server stores the data file into the file server and writes the meta data of the file into

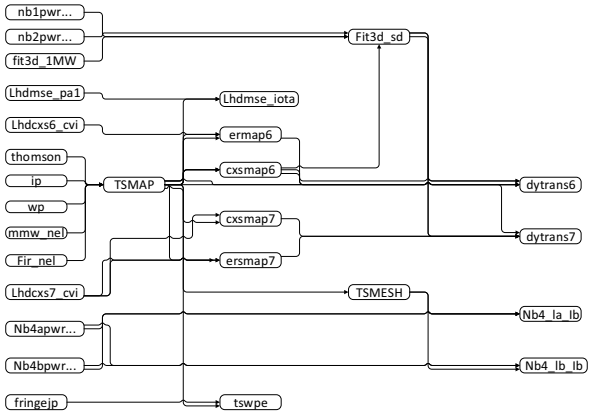

Fig. 1. The dependency diagram of the Kaiseki data.

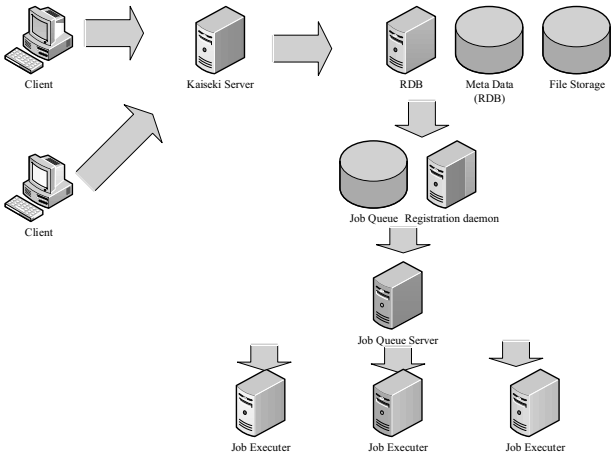

Fig. 2. System Overview

the RDB. When the table of the meta data is updated, the trigger function is called and it sends the multicast packet into the network. Because IP multicast is sent to the clients who requests, the server does not have to send packets to each client one by one. Therefore, it will not increase the server load even if the number of the clients increases in the future. Also, the client does not have to use polling method to check if the new data is registered, and it can reduce the CPU usages.

This is an event driven system and uses the IP multicast technology. When a new physical data is registered into the Kaiseki Server, it notifies the client program of the new registration by IP multicast. Because IP multicast is used for the notification, the client programs can be run on multiple computers, therefore, the system is scalable and is ready for the increase of the diagnostics. Each calculation programs is developed by the researcher who is responsible for the diagnostics. The researchers can use their favorite computer languages, such as PV-Wave, FORTRAN, Python, etc., as long as the calculation programs implement the same command line interfaces.

1) Emoto, M., et al: 9th IAEA Technical Meeting on Control, Data Acquisition, and Remote Participation for Fusion Research, Hefei, China (2013)